



# Pacific Island Network News

Newsletter of the  
Pacific Island Network  
Inventory & Monitoring Program  
Oct.-Dec. 2005, Issue no. 02

## Superinten- dent's Corner, Pg. 2

A note from the Pacific Area Director, Frank Hays, on our National Heritage and the Inventory and Monitoring Program.

## Notes from the Field - Botany on Guam, Pg. 4

Botanist and researcher Joan Yoshioka reports on I&M's plant inventory from the island of Guam.

## Featured Resource - The Hawai'i 'Amakihi, Pg. 6

This beautiful forest bird is predominantly found feeding on 'ōhi'a and māmane trees...

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Volcanic steam vents in Hawai'i Volcanoes National Park. Photo courtesy of Sonia Stephens

## Aloha. Talofa. Hafa adai. Konichiwa. Hello.

Greetings from the Park Service's only exclusively island network, covering a tropical consortium of National Parks from the forests and sandy shores of American Samoa, Guam, and Saipan to the black, green, and blue islands of Hawaii.

This second edition of the Inventory and Monitoring Program (I&M), Pacific Island Network (PACN) newsletter includes a few new sections which we believe you will enjoy. One of the exciting new columns covers a specific ecological area of concern to the Network, the spread

*Be part of the action! Please contact us with topic suggestions we should include.*

of 'ōhi'a rust. In this issue we also feature the Hawai'i 'amakihi and one of our eleven unique and spectacular parks, Kaloko-Honokōhau National Historical Park.

As we begin Fiscal Year 2006, the I&M program looks forward to the busy year ahead. The USGS, Bishop Museum, and University of Hawaii Cooperators along with NPS Park staff and I&M, will develop 8 (of 21) protocols this year, and submit them for external peer review through the Pacific West Regional Coordinator.

We are pleased to report that 52 inventory projects are now complete! Special thanks to everyone involved in the long process. These reports are now being prepared for publication in a Technical Report series due next year.

Shortly after publication of this newsletter, we will have submitted our Phase III Monitoring Plan to the Washington Support office. This Plan charts our course for the next 5-10 years,

details our natural and cultural resources in all 11 PACN parks, identifies Vital Signs for monitoring, and explains how each Vital Sign will be monitored.

On a bitter-sweet note, the Pacific Area said goodbye to our much respected and deeply admired General Superintendent, Bryan Harry, after many years of service to the National Park Service. However, NPS made sure we are expertly charting our future course, by placing Frank Hays at the helm as the Pacific Area Director. We welcome Frank, and look forward to the years ahead!

We hope you enjoy this news and commentary about our Program. Through this newsletter we share a brief glimpse of the issues the PACN tackles and some of the work done in and for America's National Parks in the Pacific.

—Leslie HaySmith,  
I&M Network Coordinator



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The National Park Service has implemented natural resource inventory and monitoring on a servicewide basis to ensure all park units possess the resource information needed for effective, science-based management, decision-making, and resource protection.

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#### Mailing List

Please pass this newsletter on to interested parties. To be added to or removed from mailing list, please contact Cory Nash.

# Superintendent's Corner

In 1933, George Wright, Joseph Dixon and Ben Thompson wrote in the book [Fauna of the National Parks of the United States](#) that “our national heritage is richer than just scenic features; the realization is coming that perhaps our greatest national heritage is nature itself, with all its complexity and its abundance of life, which, when combined with great scenic beauty as it is in the national parks, becomes of unlimited value. This is what we would attain in the national parks.”

As you might know, George Wright initiated and funded one of the first science-based wildlife surveys of the national parks. Following in the footsteps of George Wright, the National Park Service's Inventory and Monitoring Program expands our understanding and ability to care for this great national heritage.

I've been particularly reminded of the relevance of these issues in the past month. I've been doing a bit of traveling of late and in between trying to catch up with email and catching a flight, I sneak in a guilty pleasure and read a newspaper or dream about a new destination to visit as I thumb through the pages of one of the travel or outdoor magazines. It is not surprising to see a national park profiled in an outdoor magazine as a travel destination. However, I have been impressed by the ongoing

dialogue about the management of the parks that can be found in those same travel publications and other media. That dialogue illustrates the depth of the public's understanding of the significance and value of national parks. The inventory and monitoring efforts highlighted in this newsletter will help inform that dialogue.

—Frank Hays, Pacific Area Director

## Featured Staff

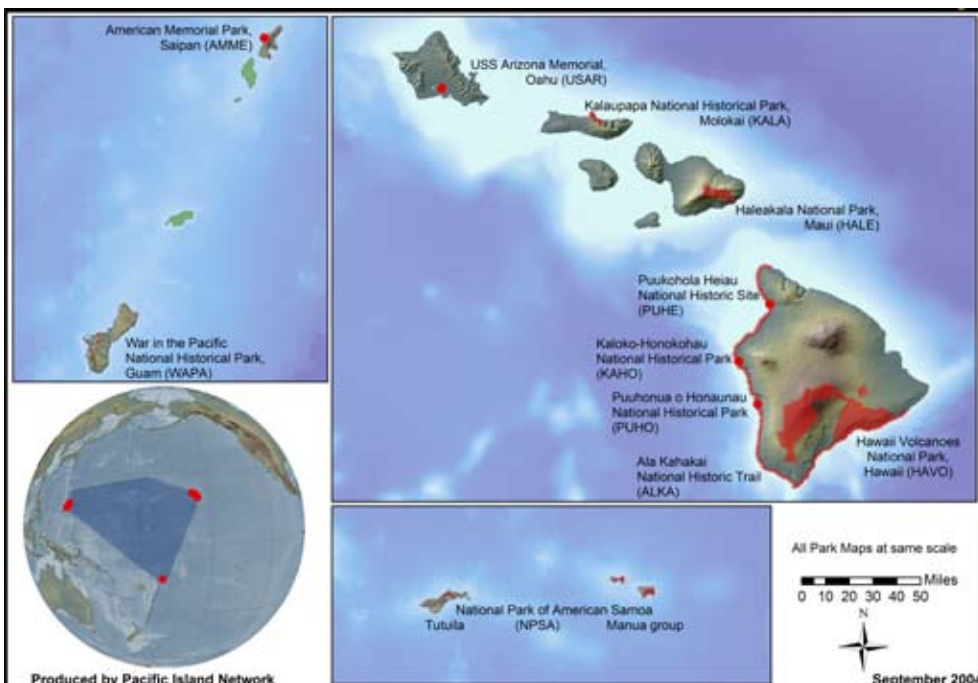
### Sonia Stephens Monitoring Plan Writer

Sonia Stephens wanted to be a paleontologist when she grew up. However, after moving from Minnesota to Kaua'i during high school she realized that fossils were hard to come by in Hawaii and decided



to study algae instead. After receiving her Master's degree in Botany and Ecology, Evolution, and Conservation Biology at the University of Hawaii, she came to the I&M program in 2003. Sonia was

first employed as the freshwater biology workgroup facilitator, and later as the monitoring plan specialist. She currently lives on O'ahu, but is in the process of moving to Florida with her rabbit, Terpsinoe (named after the Pacific Island diatom genus). Her other interests include singing with the Honolulu Symphony Chorus, hiking, and jewelry making.



Map of the Pacific Island Network and its 11 NPS units.



# Inventories: Climate

The I&M program has identified climate data as one of the core areas for which NPS needs baseline information to effectively address park planning and management needs. The PACN has a cooperative agreement with the Spatial Climate Analysis Service (SCAS) at Oregon State University to prepare a climate atlas for the Pacific Basin. SCAS will create 1971-2000 mean monthly minimum and maximum temperature, mean dew point, and precipitation maps at 500 meters or better resolution. This effort will provide a Pacific Island component to the next version of the National Climate Atlas (coordinated by the National Climatic Data Center).

Using the PRISM (Parameter-elevation Regressions on Independent Slopes Model) climate mapping system, gridded estimates of climate parameters will be generated. The model is a moving-window regression of climate versus elevation calculated for each cell in a digital elevation grid. Stations surrounding the grid

cell provide data points for the regression, using proven methods suited to our island terrain.

The maps, slated for completion in May of 2006, will cover the following islands:

- Hawaiian Islands (from Ni'ihau in the northwest to Hawai'i in the southeast)
- Guam and CNMI (Saipan, Tinian, and Rota)
- Palau
- Tutuila and the Manua Islands in American Samoa
- Federated States of Micronesia islands of Kosrae and Pohnpei.



Map of the Southwest Pacific — adapted from the *Atlas of the Pacific Islands* (Quanchi 2003)

# Data Management - Species observation data

To help PACN parks manage animal, plant, and other observations, I&M developed a “Species Observation” database. Parks may use this database, whether by individual researchers or park managers for specific projects. It may also be used as a central database for observations made by staff and visitors such as recording shark or bird sightings. Species observation records can help in the analysis of relationships between species and their physical/biological environment, as well as distribution patterns and population trends. This will result in a supportive boon to PACN monitoring efforts.

To collect observations, two types of forms can be printed directly from the database. One is a “log form” which requires minimal information and includes fields for date, species, number of individuals, location, behavior, and observer. The other is a “detailed form” (seen at right) with more in-depth information about the sighting, including behavior and weather. These forms can be completed by interested park staff or visitors at the discretion of park staff. Both

forms permit standardized recording of observation confidence and can be accompanied by supplementary materials such as photographs of species. I&M can customize the forms to meet specific needs of a park or project.

Ideally, one person/division at each park would be in charge of the database. I&M will provide database assistance, and will distribute any

needed database revisions. It will be the responsibility of each park, however, to distribute and collect forms as well as perform data entry. I&M will periodically copy each park’s database to maintain a master list of what has been observed across all parks in the PACN.

A beta version of the database is complete. If you would like to participate in the testing

phase, please contact Allison Cocke or Gordon Dicus (see page 2). Contact I&M to receive a copy of the database once we’ve completed beta testing. I&M hopes that parks will find this searchable database a useful tool for advancing the understanding of park resources.

Species Observations- Haleakala National Park

Date:Time:AM PMObservation was:seenheardsaw evidence (e.g. nest)

Species:Number Observed:Within Park Boundary?YesNoUnsure

Observer:Confidence:positivefairly confidentsomewhat confidentunsure

Location:Elevation:ft m

Location Determined by: (GPS, map, etc.)If GPS was used, please provide:

Coordinates:Datum:Accuracy:

DetailsSize:Color:

ID Marks:Track/Sign:

Use Codes- see other side of sheet

Terrain:Habitat:Slope:Behavior:Precipitation:Wind:

Circle one

Age:AdultSubAdultJuvenileOtherGender:MaleFemaleUnknown

Additional Notes

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# Monitoring

The Pacific Island Network's draft Monitoring Plan identifies 34 critically important Vital Signs for monitoring park ecosystem integrity. Thirteen of these Vital Signs are currently monitored by parks or partner organizations, and the network is preparing Vital Sign Monitoring protocols to NPS I&M program standards for the remaining 21. These Vital Signs are organized into a 3-level hierarchical framework to help address a broad spectrum of resource issues across physical, biological, and human use categories.

To obtain data for the 13 Vital Signs already being monitored, the PACN will collaborate with those conducting the work: network parks, other NPS programs, and other federal or state agencies. These 13 existing monitoring programs typically have mandates that address

a similar suite of objectives to those identified in our monitoring plan. Additional monitoring also exists, but the network has made the decision that these 13 indicators provide the level and quality of detailed data and information that warrant inclusion in our monitoring plan.

The first two monitoring protocols are anticipated to be completed in December 2005, with the remaining protocols completed over the course of the next three years. The standards which these protocols must meet include rigorous peer review and distribution of the completed protocols to foster cooperation, collaboration, and communication among the conservation community.

Completing and implementing

and took photos of hundreds of plant species in the park to serve as a record of our findings. During the course of the survey and follow-up herbarium reviews, we identified almost 400 plant taxa from the park. About 44% are native to the Mariana Islands with 15 endemic species. Some native plants of conservation and/or cultural interest that we observed included: Pahong (*Pandanus dubius*), with fruit clusters that resemble a giant, spiny soccer ball, *Cerbera dillitata* with delicate white pinwheel flowers, and large ifit trees (*Intsia bijuga*), the territorial tree.

Besides the interesting plant life, we also found many remnants of World War II battles such as bunkers, gun emplacements and fox holes. Jenny and I found it impossible to walk through the field without remembering the thousands of people that lost their lives a mere 60 years ago while fighting on the same ground that we were hiking. My experiences on Guam were memorable and not easily forgotten. If given the chance, I'd do it all over again, minus the wasp stings.

-Joan Yoshioka

21 Vital Sign Monitoring protocols and keeping up with the 13 Vital Signs monitored by others presents significant logistical challenges. To accomplish this task, we anticipate extensive interactions with partners throughout the Pacific region: federal, state, and territorial agencies, educational institutions, nonprofit organizations, and others. Given that these partnerships span the 11 units of the PACN, we have only begun to scratch the surface of this exciting chapter in our Vital Signs Monitoring Program.

## **Park Vital Signs With Protocols Being Developed (Principal Investigator)**

Seabirds (D. Duffy & D. Hu)

Landbirds (T. Pratt & R. Camp)

Erosion & deposition (TBD)

Groundwater dynamics (S. Anthony)

Water quality: Chemistry (TBD)

Status and trends of established invasive plants (J. Jacobi)

Early detection of invasive plants & invertebrates (L. Loope)

Benthic marine community (E. Brown & L. Basch)

Marine fish (J. Beets & A. Friedlander)

Fisheries harvest (P. Craig)

Bats: insectivorous (L. HaySmith)

Bats: frugivorous (L. HaySmith)

Freshwater animals: perennial streams (A. Brasher)

Freshwater animals: intermittent streams & pools (D. Foote)

Terrestrial invertebrate communities (D. Foote & K. Magnacca)

Cave community (F. Howarth & J. Moniz Nakamura)

Focal terrestrial plant communities (J. Jacobi)

Focal & RTE plant species (J. Jacobi & Linda Pratt)

Landscape dynamics (S. Margariter & M. Lane-Kamahele)

Viewscapes (L. Tamimi)

Climate (TBD)

## **Currently Monitored Resources**

Visibility & particulate matter

Atmospheric gases

Volcanic ground deformation & lava flows

Seismic activity

Stream flow

Sea level

Water Quality: Toxics

Water Quality: Microorganisms

Sea turtles

Hawaiian monk seal

Nene distribution and abundance

Waterbird distribution and abundance

Park Visitation

## Notes from the Field

If someone asked me today to search for plants in 80+ degree weather and 80% humidity, where I might encounter stings from nasty wasps that will make my arm swell to twice its size, wade through sword grass that cuts flesh like butter, and carry out much of the work in tropical storm weather, I still would say, "Sure!". I had the wonderful opportunity to conduct a plant inventory at the War in the Pacific National Historical Park (WAPA) on Guam in the summer of 2004 with my intrepid field partner, Jenny Drake, a local Chamorro woman and NPS Biological Technician extraordinaire.

WAPA was established to honor the bravery of soldiers that participated in World War II and to preserve cultural sites. However, the park contains significant biological resources as well. The park is well known for its diverse coral reefs, and has one of the highest levels of coral diversity of all the parks



Pahong (*Pandanus dubius*) found in limestone forests of Mount Alifan Unit, WAPA

in the NPS. Nonetheless, it was our job to document WAPA's terrestrial plants. Therefore, in 2004, Jenny and I spent a month hiking through the park's seven units and recording all of the plants we observed. We collected

# Program Updates

**Protocol Sampling:** In late August, the PACN held a sampling design meeting for monitoring protocols at the University of Hawaii at Hilo. This brought together the Principal Investigators, NPS Leads, and CESU facilitators working on all 21 monitoring protocols, along with two contracted statisticians to assist with sampling design of protocols. Both statisticians have broad backgrounds in environmental sampling methods. Dr. David Schneider is a Professor and Associate Dean of Science at Memorial University in Canada and is well experienced in quantitative biology and population interactions of fish and other large marine organisms. Dr. John Skalski is a Professor of Biological Statistics at University of Washington and has broad experience in terrestrial wildlife and fisheries population estimation and environmental sampling.

Designing a sampling scheme for a long-term monitoring project is one of the most critical steps in planning for implementation. Key decisions include: the number and location of monitoring sites within a park, whether and how park segments will be stratified, timing of sampling, and how to locate new sites if established ones become unsuitable. These decisions about sample design and statistical inference must be balanced with costs and logistical considerations, documented so biologists decades into the future can continue scientifically credible monitoring for comparable research.

During the meetings with Drs. Schneider and Skalski, the Vital Sign Protocol PIs explained their approaches to monitoring, described logistical challenges, and discussed data from

past projects that could be extrapolated to provide estimates of variation to use for sampling design. This information, collated by the network staff, is being used to complete portions of our monitoring plan. Feedback from the PIs has been positive with most agreeing that the meetings were very useful. As the PIs begin to work more intensively on their monitoring protocols, we will facilitate further interaction with the contract statisticians, beginning with another meeting in early November.

**AARWP and New Aquatic Ecologist:** The network is just finishing our Annual Administrative Report and Workplan. The FY2005 Workplan has been regionally reviewed and is under further revision. The draft FY2006 Workplan portion is also completed, and will be revised based on regional and network feedback. We have also selected an I&M Aquatic Ecologist. We anxiously await this anticipated addition to our staff.

**Monitoring Plan:** The PACN anticipates a busy Fall. A complete draft of our Vital Signs Monitoring Plan is due to the Washington DC office on 12/15/05 (mail out 12/14/05). As of 10/01/05, we had rough drafts for all 11 chapters completed for review. We anticipate further revisions up until the submission deadline. On a related note, the Benthic Marine Vital Sign will be 'fast-tracking' protocol development, completing the protocol by 12/31/05. Many thanks to the busy Coral Reef Program staff (especially PI Eric Brown and I&Mer Raychelle Daniel). We hope this experiment provides invaluable insight into how the network can complete other protocols in an accelerated fashion.

## Calendar — October-December

Oct. 11	I&M "After Dark in the Park" program at Hawai'i Volcanoes National Park presentation by L. HaySmith and J. Yoshioka
Oct. 11	Administrative Annual Report & Workplan (AARWP) due to the Pacific West Regional office
Oct. 28	Complete draft of Phase 3 report (Monitoring Plan) to internal reviewers including new PWRH Director, F. Hays
Oct. 31-Nov. 4	Marine Benthic Community Vital Sign protocol workshop and Sample Design - statistician workshop
Nov. 4	Administrative Annual Report & Workplan (AARWP) due to Washington, DC office
Dec. 15	Monitoring Plan report due to WASO office (Dec. 14 - mail out)

## Games Corner

**"Flesh to Feathers"**  
Hawaii's endemic forest birds are among the Nation's most threatened and endangered animals. Can you match up the hatchlings on the left with the adults on the right?  
*Did you know that the 'Alala or Hawaiian Crow is no longer found in the wild?*

Answers are below:



Chick photos courtesy of Gail Ackerman  
Adult photos courtesy of Jack Jeffrey

'Alala 1 - B  
Hawai'i Creeper 2 - A  
Puaiohi 3 - D  
Maui Parrotbill 4 - C





## Hawai'i 'Amakihi

**Description:** The Hawai'i 'amakihi (*Hemignathus virens*) is a small yellow-green honeycreeper found exclusively on Hawai'i island. The Hawai'i 'amakihi is one of a group of closely related honeycreepers found across the state of Hawaii. The other members, the Maui (nui) 'amakihi, the Kaua'i 'amakihi, and the O'ahu 'amakihi, reside on their namesake islands. The omnivorous 'amakihi feeds on nectar, insects, juices, fruit pulp, and sap from both native and non-native plants and trees. Hawai'i 'amakihi are found across a range of landscapes, from xeric scrubland to rainforest and across an elevational gradient, from sea level to subalpine forest.

**Inventories:** Forest birds are generally surveyed using a Variable Circular Plot (VCP) method where the observer stops for 8 minutes and listens at stations across a transect. The observer records the number and species of birds detected, and the estimated distance from which they are detected. Another method of surveying birds in unforested areas is the line transect technique whereby the observer records the bird species, distance, and angle to the bird while walking along a transect. In the most recent I&M surveys, Hawai'i 'amakihi were detected in Hawai'i Volcanoes National Park on Hawai'i island; Maui 'amakihi were found in Haleakalā National Park on Maui and Kalaupapa National Historical Park on Molokai. Results from these surveys will be published in forthcoming technical reports.

**Monitoring:** Forest birds are being monitored for species density using the VCP method on preexisting transects. These surveys will take place at 5 parks within the Pacific Island Network: American Memorial Park, Haleakalā National Park, Hawai'i Volcanoes National Park, Kalaupapa National Park, and the National Park of American Samoa. Vegetation associations will also be documented to correlate habitat management with species abundance. The forest bird counts are a collective effort between NPS, USGS, USFWS, and state agencies. [The Hawaii Forest Bird Interagency Database Program](#) receives and analyzes the data from the surveys.

**Data:** [The U.S. Geological Survey, Pacific Basin Information Node](#), maintains a list of relevant bird databases, reports, and other products.

**Status & Trends:** Since the colonization of humans in Hawaii, native birds have suffered a significant decline. The majority of all native species is now extinct. Traditionally, 'amakihi were hunted for feathers, though this did not seem to have a significant effect on the species population. Hawai'i 'amakihi have consistently been the most widespread honeycreeper on Hawai'i island. Presently, the biggest threats to Hawaiian birds are habitat destruction, avian disease, and predators. Predators include feral cats, mongooses, roof rats, barn owls, and the native pueo (short-eared owl). Avian malaria and avian pox, both spread through mosquitoes, cause direct and documented mortality in native honeycreepers, though Hawai'i 'amakihi may be developing some resistance to the diseases. The Hawai'i 'amakihi seems to be increasing in population size in lowland areas.

**Management:** Habitat protection, including predator control and native plant restoration, benefits not only the 'amakihi but all native birds. Lowland 'ōhi'a forests need considerable protection, as they are quickly disappearing

due to development and alien plant invasion. In addition, removing pigs, which encourage the spread of mosquito borne diseases, has been found to benefit native forests. Furthermore, a massive effort to remove alien plants and outplant native plants on public lands would expand habitat for many native bird species including 'amakihi. By incorporating these and other management guidelines we may once again hear the songs of the 'amakihi commonly echoing through Hawaii's healthy forests.

*For Questions or Comments Contact  
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### Where to see 'amakihi:

'Amakihi, a beautiful forest bird is predominantly found feeding on 'ōhi'a (*Metrosideros polymorpha*) and māmane (*Sophora chrysophylla*) trees. In HAVO, Hawai'i 'amakihi can usually be seen at 'Āinahou Ranch. The Maui-nui 'amakihi are slightly paler with narrower and darker lores than the Hawai'i subspecies and can be found at Hosmer Grove in Haleakalā NP and lower Waikolu valley in Kalaupapa NHP. All subspecies of 'amakihi have a slightly decurved bill and dark lores. Calls are varied and include an upslurred whistle and a sewing machine like trill, among many others. The Hawai'i 'amakihi can be confused with the endangered Hawai'i creeper, but the creeper has a straighter bill and a descending trill song.



This Hawai'i 'amakihi was caught and released during field work on Hawai'i Island.

Photograph courtesy of Phil Taylor.



## ‘Ōhi‘a Rust

**Background and Description:** The neotropical rust disease *Puccinia psidii*, variously known as guava rust, Eucalyptus rust, and (very recently) ‘ōhi‘a rust, is an emerging plant pathogen in the Pacific. Described in the 1880s as growing on leaves of native common guava (*Psidium guajava*) in Brazil, it spread by the 1950s to introduced plantations of Eucalyptus in Brazil, subsequently destroying the allspice (*Pimienta dioica*) industry in Jamaica. This pathogen is now recognized as a widespread pest in the neotropics with an unusually broad host range (potentially all family Myrtaceae). Symptoms of the disease first begin as tiny bright yellow powdery eruptions in a circular pattern on the leaf or stem surface. These infection foci or spots expand and spread, often killing leaves, stems, or shoots. Leaves and stems can be deformed by the disease, and growing tips can die back. Symptoms are most likely to be seen on tender, young growing tips. The long-term implications of ‘ōhi‘a rust for ‘ōhi‘a forests are uncertain. (See [www.hawaiiag.org/hdoa/npa/npa05-04-ohiarust.pdf](http://www.hawaiiag.org/hdoa/npa/npa05-04-ohiarust.pdf))

### Introduction to the Pacific Islands:

This rust was first found in Hawaii on an ‘ōhi‘a plant (*Metrosideros polymorpha*) on O‘ahu in April 2005. It poses a formidable threat to Hawaii’s ‘ōhi‘a, a species that dominates perhaps 80% of Hawaii’s forests and provides essential habitat to much of Hawaii’s fauna. American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands have native Myrtaceae too, and although *Puccinia psidii* has not yet been documented on these islands, precautions are warranted.

**Why and where this is a threat:** Mycologists have called attention to adverse consequences of continuing introductions of pathogenic fungi. This causes increased pathogenicity and host range due to genetic recombination and hybridization. Although ‘ōhi‘a rust has not been documented within PACN parks, it appears to be an imminent threat, especially to HAVO, HALE, and KALA where the ‘ōhi‘a is a dominant tree species. Attention to this problem is also warranted for the Western Pacific:

NPSA has five species of Myrtaceae, including the common *Syzygium inophylloides*, a bat dispersed species. In the Mariana Islands, the threat is likely similar to American Samoa, with a variety of native and non-native Myrtaceae present.

Experience from South Florida suggests multiple introductions over the past three decades may have broadened its host range. First found in Florida in 1977 on allspice, there was little notice of other hosts until 1997 - 1998, when an outbreak of the rust was noted on paperbark trees (*Melaleuca quinquenervia*). Since 1998 this invasive rust has become an increasing problem in Florida for commercial nurseries, homeowners, and native stands of certain Myrtaceae.

**Management:** An action plan with two basic provisions is needed: (1) Strategies to exclude from island groups any additional genetic material of ‘ōhi‘a rust arriving via pathways such as nursery stock, seed and fruits, lumber and wood packaging material from any location where *Puccinia psidii* may be present, and (2) Monitoring throughout the geographic range of ‘ōhi‘a rust (especially at high elevations), to determine the genetic composition (strains, or recognizable groupings of DNA) of rust populations present in the various island

groups to assure that additional genotypes are not allowed to arrive. Close coordination between current plant quarantine efforts and surveillance of rust populations in the field is required. Surveillance must also include use of molecular tools, since genotypes cannot be recognized visually.

In Hawaii the initial response is to advocate tightened quarantine efforts to keep any additional genetic material of *Puccinia psidii* from entering the state. Such precaution is necessary to prevent the gradual deterioration of ‘ōhi‘a forests.

*For Questions or Comments Contact:*

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### How you can help:

Every citizen can do his or her part by becoming knowledgeable about invasive species issues and educating relatives, friends, and neighbors about gaps in our invasive species prevention system.

*For updates and more information:*

[www.hear.org/species/puccinia\\_psidii/](http://www.hear.org/species/puccinia_psidii/)



‘Ōhi‘a Rust (*Puccinia psidii*) on the leaf of a Java Plum (*Syzygium jambos*) on Maui (August 2005).

Photograph courtesy of Forest and Kim Starr (USGS)





## Kaloko-Honokōhau NHP

### Natural History and Resources:

Kaloko-Honokōhau National Historical Park (KAHO) boasts a wealth of natural and cultural resources. Outstanding features of this park include two ancient fishponds, Kaloko and 'Aimakapa, constructed and managed by Hawaiians to provide a consistent fisheries food supply. The U.S. Fish and Wildlife Service has also recognized 'Aimakapa Fishpond as significant habitat for endangered waterbird populations on the Kona Coast. Additionally, KAHO contains more than 100 anchialine pools (in-shore brackish water ponds) supporting endemic flora and fauna. Other natural resources at KAHO include coral reefs, coastal dryland forest, and bare lava fields. Endangered and threatened species include: the Hawaiian stilt, Hawaiian coot, hawksbill and green sea turtles, Hawaiian monk seal, migrating humpback whales, several plants, several anchialine pool shrimp species, and the orangeblack damselfly.

**Cultural History and Resources:** In addition to the fishponds, more than 250 archaeological sites have been documented in the park. These include hundreds of petroglyphs, habitation structures, dryland agriculture features, shrines, temples, trails, a salt pan, and a hōlua (stone slide).

Cultural history is emphasized at KAHO which centers on traditional fishing activities and includes fishpond management which formed the basis of the Hawaiian subsistence economy. Anchialine pools are also important culturally, as they were a significant water source for drinking water and were divided into different functions such as bathing and washing. The openness and natural surroundings of Kaloko-Honokōhau, as well as its numerous archaeological sites and the wealth of Hawaiian lore from the area's cultural heritage, make KAHO an ideal setting for demonstrating, teaching, and learning what is truly Hawaiian.

### Inventory and Monitoring Highlights:

In 1996, 116 vascular plant species and 25 bird species, including two endangered waterbirds, were observed at KAHO. An inventory of the insect fauna in 1992 found relatively few native

terrestrial arthropods. The Hawaiian hoary bat has also been surveyed within the park. In addition, a herpetological inventory conducted in 2004 yielded 7 species (with 2 additional species likely found in the park). In 1990, 150 marine fish species were documented and additional inventories are planned for corals, fish, algae, and other invertebrates.

Wetland bird populations are monitored at 'Aimakapa fishpond via an agreement with Ducks Unlimited. Furthermore, populations of damselflies breeding in anchialine pools have been monitored for several years. The park has also conducted cooperative green sea turtle monitoring with NOAA since 1999. NPS and USGS collaborators began monitoring for recruitment of key coral reef invertebrates and fishes in 2003. In addition, groundwater quality, anchialine pools, and fishponds are being monitored by KAHO staff. Finally, low frequency anthropogenic sounds in the marine waters of KAHO were monitored from 2004 to 2005.

The reintroduction of native plants is recorded using GPS and monitored for success rates. Also, an automated weather system has been installed. In the future, monitoring at KAHO will include native bees and damselflies, freshwater flora and fauna, and coral reef health.

**Current Issues in Management:** Control of alien invasive species, protection of threatened, endangered and rare species, and managing potential impacts to water quality from neighboring developments are central to natural resource management at KAHO. The park's general management plan highlights preservation, restoration, and interpretation of traditional Hawaiian culture and values, and includes maintaining access to traditional fishing and gathering areas. Plans are underway for Kaloko Fishpond to incorporate traditional Hawaiian aquaculture practices following the restoration of the Kaloko kuapā (fishpond wall). Protection of the water quality and quantity supplying the fishpond is crucial to its successful restoration. Native coastal dryland forest plant communities are being restored in several locations in the park.

### Come visit us:

Kaloko-Honokōhau NHP is located three miles north of Kailua-Kona on the west coast of Hawai'i Island. The park is 1,160 acres in size, including 596 acres of marine waters. Kaloko-Honokōhau is located on a combination of flat (pāhoehoe) and rough volcanic (a'a) deposits from Hualālai volcano, which last erupted in 1801.

KAHO Superintendant: Geri Bell

On the Web at: <http://www.nps.gov/kaho/>



The recently restored fish-wall protecting Kaloko pond from the ocean.

Photo taken by Richard Gmirkin